



Incident Investigation

Ammonia Release and Workplace Fatality Report

7 Channel Street
Boston, MA

March 23, 2016

Prepared By:



HCG Associates

STAV_17-000123

INTRODUCTION

On March 23, 2016 at approximately 1753 hrs., an ammonia emergency occurred at Stavis Seafoods 7 Channel St. Boston, MA processing facility. This event ultimately led to the release of approximately 2,169 lbs of Anhydrous Ammonia and the death of Stavis Refrigeration Engineer Brian Caron. This report will, under the guidance of the OSHA Process Safety Management standard 29 CFR 1910.119, investigate the uncontrolled release of Anhydrous Ammonia as well as attempt to identify any root causation associated with the workplace fatality.

Furthermore, the purpose of this formal incident investigation is to review all aspects of the Stavis Seafoods anhydrous ammonia refrigeration system, and identify any gaps that may need corrective action and preventing the reoccurrence of similar incidents. This incident investigation was initiated immediately following the March 23, 2016 release and fatality, and in addition to the Stavis Investigation Team, inputs from OSHA, EPA, and the Boston Fire Department were utilized throughout the process.

SCOPE

In accordance with 29 CFR 1910.119, as well as a 527 CMR 1.00 c60 (formerly CMR 33) a formal incident investigation shall be performed anytime there is an incident which resulted in, or which could have resulted in a release of ammonia. For the purposes of this guidance, a catastrophic release is defined as a major uncontrolled emission, fire, or explosion involving ammonia that presents serious danger to employees, the employees or contractors working on-site, or to off-site neighbors and the public. Any incident meeting the following criteria shall be investigated:

- Release of 100 lbs or more
- OSHA permissible exposure limit of 50 ppm is exceeded in the building or space
- There was a significant product loss or damage to the facility
- A fire occurred as a result of the release
- An explosion occurred as a result of the release
- There was an injury or death
- There was failure of safety equipment
- Evacuation of any personnel
- Activation of ammonia detection equipment

Based upon this criteria, the Stavis Seafoods Investigation Team has focused on all aspects of the ammonia system, alarm system and detection devices, and Stavis Seafood policies and procedures associated with the operation and safety policies in effect at the time of incident.

Incident Investigation Team:

On March 25, 2016 a formal incident investigation team was assembled to establish the parameters that would be followed and to assist the team in establishing baseline investigative procedures. The Team was appointed by Stavis Seafood's President, Greg Burgess. The team makeup included the following individuals:

Scott Sweet – Team Leader & Stavis Safety Consultant

Greg Burgess – President, Stavis Seafoods

Mary Fleming – Chief Financial Officer, Stavis Seafoods

Brett Heidtke – Director of Operations, Stavis Seafoods

Gary Hardin – EHS/Regulatory Affairs Manager, Stavis Seafoods

Art Antczak – Operations Manager, Stavis Seafoods

Mike Sirois – President, American Refrigeration Company

Carlos Rita – Service Manager, American Refrigeration Company

The Incident Investigation Team immediately met both formally and informally via conference calls. A bi-weekly meeting schedule was implemented until the incident investigation findings and report was completed. These items were communicated with all Stavis Seafood's employees.

Incident Background

On March 23, 2016 at approximately 17:55 hours, the Boston Fire Department received a 911 call from an unknown passerby stating that they smelled a strange odor at the corner. The Boston Fire Department dispatched companies to the area of Summer and Fargo Sts. to investigate. At approximately 18:11 hrs. Boston Fire reported that they had a strong odor of Ammonia coming from the area of Stavis Seafoods. Initial reports by the Boston Fire Department units on scene stated that there were no audible alarms sounding but only a red strobe flashing on the exterior of the building.

Stavis Seafood employees working within the 7 Channel Street facility were not aware of the ammonia leak until an employee smelled the ammonia in Cooler B, and subsequently the activation of the ammonia alarm system which was set off by an ammonia detector in Cooler B. (At this time there were a total of 4 Stavis Employees working in the facility in addition to Brian Caron, the refrigeration engineer. Based upon a review of video surveillance it was determined that the refrigeration engineer made entry into the Ammonia Engine Room at 17:40 hours). Upon the evacuation of the facility, Stavis Seafoods' employee Jose Melgor noticed that the Refrigeration Engineer's vehicle was still on site and went to the Engine Room to see if he was there. Upon opening the door to the Engine Room he was overcome by ammonia vapor and retreated to a safe area of refuge.

The Boston Fire Department upon arrival at the 7 Channel St. facility activated the ammonia system Emergency Stop located on the exterior of the building and attempted to make a rapid entry and rescue with non-chemical protective clothing. Boston Firefighters made it as far as the entrance to the second floor of the engine room before being driven back due to the concentration and toxicity of the ammonia release. Initial fire department personnel saw a downed victim in the engine room, but due to the high concentration of ammonia were unable to proceed any further or affect a rescue at that time. Upon arrival of the Boston Fire Hazmat Team multiple entries in chemical protective clothing were undertaken and the victim was eventually removed and decontaminated, but ultimately succumbed to his injuries.

An American Refrigeration employee upon hearing of the emergency, self dispatched from his home to the Stavis site, and with the Boston Fire Department assisted in shutting down the ammonia system. All of the Ammonia Liquid/Vapor was released to atmosphere, and a small amount of system compressor oil was released within the confines of the engine room.

Upon the order of the Boston Fire Dept., OSHA, and EPA, 7 Channel St. has remained closed as of this final report.

Investigation Overview

As part of the Incident Investigation Team's responsibility and charge, the Team collected information through the analysis of reports, employee interviews, meetings with regulatory agencies, and a review of the incident timeline. A comprehensive search for facts surrounding the incident on March 23, 2016 was undertaken by the Team including:

- ❖ Incident Site Visit
- ❖ Employee Interviews
- ❖ Review of Ammonia Alarms Log
- ❖ Review of the Engine Room P&ID's documentation
- ❖ Review of mechanical equipment repairs
- ❖ Training and Personal Protective Equipment documentation
- ❖ Analysis of conditions or circumstances that deviated from accepted practices.

The Team attempted to analyze the occurrence, and effectively establish recommendations that can be implemented in order to correct or prevent a recurrence of a similar incident. Although typically the Team would work to determine the cause and origin of the incident, in this case the suspected piping and appurtenances are currently in the possession of OSHA, and unavailable for review by the Incident Team at the time of this report.

Ammonia System Design

The Anhydrous Ammonia Refrigeration System located at the 7 Channel St. facility was constructed in 1983 with an addition constructed in 2005 to both the facility and the ammonia system. The initial system construction was by Lewis Refrigeration and met the applicable standards and regulations at the time of construction. The 2003 addition was constructed by Stahlman Engineering and the installation upgraded facets of the refrigeration system.

The refrigeration system utilizes the standard refrigeration cycle and uses anhydrous ammonia as the refrigerant. The system operates a multi-temperature two stage liquid recirculation refrigeration system. The system consists of 5 interconnected subsystems:

1. Low Temperature re-circulating system
2. High Temperature re-circulating system
3. Condenser System
4. Compressor Low-temperature system
5. Compressor High-temperature system

At the time of construction all system vessels and the construction of the refrigeration system met recognized and generally acceptable good engineering practices which included the ASME Code, IIAR, ANSI, ASHRAE, as well as any relative OSHA and EPA standards.

The team also investigated system documentation, maintenance and equipment purchases. In addition all system inspections by third party agencies, vessel inspections, and regular internal Stavis inspection documentation were reviewed and determined to have met current requirements.

Incident Observations

The Incident Investigation Team through the course of the investigation uncovered key items that in some cases overrode inherent safety systems and were outside of the scope of recognized practices, but in no way contributed to the Anhydrous Ammonia release and furthermore the death of the Refrigeration Engineer. These items are deviations from normal operations and standard operating procedures and are being published not to lay blame, but to identify corrective actions that will eliminate future incidents.

1. At the time of the incident the engine room ammonia detectors had been placed out of service and off line. Accessibility to the detection programming was only with the Refrigeration Engineer. This delayed the initial notification of an ammonia release to the rest of the facility and delayed notification to the fire department.
2. Although issued and trained on air purifying respirators, the refrigeration engineer did not have a respirator or any personal protective equipment with him at the time of the incident.
3. There was no “buddy system” utilized when inspecting or working in the engine room. The refrigeration engineer did not notify any employee that he would be working on the ammonia equipment outside of his regular shift hours.
4. The engine room emergency ventilation system activation was delayed due to the disabling of the detection system.
5. Additional engine room and machinery safety cutouts were not activated due to the disabling of the detection system. This lead to the release of 2,169 lbs. of Anhydrous Ammonia from the system.
6. Preliminary findings indicate that the ammonia piping at the base of the High Pressure Pilot Receiver may have been accidentally stepped on, bending the piping and causing the release of both liquid and vapor states of ammonia. The piping in question showed that some external force was applied to it.

Investigation Conclusion

After reviewing all of the available information and documentation the Incident Investigation Team found no evidence of any preventative maintenance or system repairs being performed at the time of the accident. In addition, no tools, oil draining equipment, or regularly performed functions appear to have been initiated. The Refrigeration Engineer was located steps away from the ammonia vessel at the time of release and no tools were located in the near vicinity or on his person at the time of the incident.

Therefore, based upon the information available throughout the investigation process, it is the conclusion of the Incident Investigation Team that this incident appears to be purely accidental and not associated with any system or pipe failure. However, until such time as the regulatory authorities perform non-destructive confirmatory testing on the pipe assembly, the Investigation Team cannot provide a conclusion with absolute surety.



Piping Assembly at the Pilot Receiver

Investigation Recommendations

Throughout the course of the Incident Investigation, it was the goal of the Investigative Team to identify areas of concern, and develop or implement policies, procedures, mechanical safety initiatives or alternatives that would ultimately eliminate any future occurrence. Based upon the collection of information, documents, employee interviews, as well as reviewing the standards and codes relating to the ammonia mechanical equipment, and its maintenance and repair, the Stavis Seafoods Incident Investigation Team puts forth the following recommendations:

Engineering Recommendations

- ❖ Improve safeguards that eliminate the ability to override the ammonia detection system, and that resets the detection system after a set period of time.
- ❖ Ensure that the Ammonia Detection System is tied into and monitored by a Central Station Alarm Company. This will provide automatic notifications to the Fire Department in the event of an alarm.
- ❖ Improve egress to the Ammonia Engine Room
- ❖ Separate the 2nd floor of the Engine Room from the Maintenance Shop.
- ❖ Map out facility drainage, i.e. the location storm drains empty out to.
- ❖ Investigate the implementation of Card Key access to the Engine Room.

Administrative Recommendations

- ❖ Increase training programs for all Stavis Seafood's employees
- ❖ Implement the "2 in 2 out rule", not allowing refrigeration maintenance employees to enter the Ammonia Engine Room alone.
- ❖ Develop procedures that ensure that tasks associated with any safety system are completed immediately.
- ❖ Implement an independent 3rd Party Audit Program.
- ❖ Utilize Stavis Seafood's Safety Committee to ensure continuous quality improvement as an approach to quality management and oversight of safety related concepts..
- ❖ Improve upon the training requirements for new employees at all Stavis Seafoods facilities.
- ❖ Improve current chemical hygiene controls and good work practices.
- ❖ Interface with the Boston Fire Department and implement annual facility tours.

- ❖ Define the job description and responsibilities of the Safety Office.
- ❖ Ensure that the Ammonia Refrigeration Management Program is overseen by the Safety Office
- ❖ Review the Policies, Plans, and Procedures relative to the construction of a new Stavis Seafood's Facility.
- ❖ Commission a survey of the ammonia engine room to ensure that the location of any ammonia piping or appurtenances cannot contribute to an accidental release.

Investigative Team Summary

The objective of the Incident Investigation Team focused upon reviewing the safety systems, policies and procedures, and the ammonia refrigeration management in order to prevent future incidents and to comply with the myriad of EPA and OSHA regulations. Moving forward, the Investigation team will continue to provide oversight and guidance to ensure that these recommendations, both administrative and engineering based, are implemented and improved upon in order to continue providing the employees of Stavis Seafoods a safe workplace, and furthermore remain a responsible steward to our customers and the public.

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APPENDIX A





